

## A. SYNOPSIS OF THE AMERICAN SPECIES OF CICUTA

MILDRED E. MATHIAS AND LINCOLN CONSTANCE

The water hemlocks are of especial interest because of their poisonous properties, which make them a menace both to livestock and human beings. In a recent paper, Bomhard (1) remarks that, "The extremely toxic character of the underground parts ranks this genus as one of the most virulently poisonous groups of flowering plants native to the North Temperate Zone." Hence, a great deal of space has been devoted to them in agricultural bulletins, some of which have directed considerable attention to the specific differences allegedly discernible in the subterranean portions of the plants. It is the purpose of the present paper to evaluate the characters which have been used to delimit species in the genus, and to propose a somewhat revised taxonomic treatment. Specific descriptions for *Cicuta* will appear in a forthcoming number of "North American Flora."

In their pioneer revision of North American Umbelliferae in 1888, Coulter and Rose (2) referred the known members of the genus in America to three species, the European *Cicuta virosa* L. (with two varieties), *C. Bolanderi* Gray, a plant endemic to the California salt marshes, and *C. bulbifera* L. *Cicuta bulbifera*, easily separable from the other species by virtue of the usually asexual reproduction through the agency of bulblets in the axils of the upper foliage leaves, will not enter into the following discussion. This rather simple picture of the genus was upset the following year by Greene (4), who excluded *C. virosa* from America, and described three additional species from the western United States, *C. occidentalis*, *C. purpurata*, and *C. vagans*. At the same time, he enunciated his faith in the value of vegetative characters in distinguishing the species of water hemlocks in the following words: "In the few families of plants which are, like the Umbelliferae, preëminently natural, the anthological and carpological characters, whether of genera or of species, are apt to be very slight. But here Nature comes usually to the rescue of the despairing carpological systematist, and gives him good characters for his genera, or for his species, in the vegetative organs. Only by regarding these latter can a man set good limits to species in such a genus as *Cicuta*."

Again, in November of the same year, he re-emphasized (5) and elaborated this view, as follows: "The fact is well recognized, or should be, by descriptive botanists, that in herbaceous plants of all kinds, characters of the roots or other subterranean organs are of the very best for specific distinctions. Those of pubescence, foliage, and to some extent, of the flower also, are less constant within specific limits than are the peculiarities of the root, when the root happens to have peculiarities, which is however by

JAN 22 1942

no means the rule in nature. Most commonly the roots, rhizomes, tubers and other such organs will be much the same throughout the whole group—a long series of species, or even an entire genus. In an order so extremely natural as that of the Umbelliferae, in which the fruits are so similar that plants of the same carpology are sometimes placed in different genera in deference to merely vegetative differences, it would seem altogether unphilosophical to require of the fruit that it furnish specific characters; or, to assume that unless the supposed members of a genus can be distinguished carpologically the species is but one."

Coulter and Rose, in their later treatment of the Umbelliferae (3), accepted two of the three species Greene had described, but judged *C. purpurata* to be conspecific with *C. Douglasii* (DC.) C. & R. They added to the list of species *C. Curtissii*, conspecific with *C. mexicana* which they had already described earlier in the same year. Although they accepted Greene's species, they were not entirely convinced of the validity of the characters he had originally employed in distinguishing them: "We reproduce the above key in the hope that it may be further tested in the field, for with the material at our command we have not been able to follow it fully. While we recognize in Professor Greene's typical material the differences suggested, we do not find them constant. The fleshy thickening of the rootstocks and their direction, as well as the thickness and elongation of the roots, seem to vary with the nature of the substratum, as might be expected." The synoptical key offered by Greene, modified by the inclusion of the species he later described follows.

\* Root axis very short, nearly or quite erect, not enlarged, its partitions crowded.

+ Roots all alike, slender fibrous.

*C. virosa.*

++ Main roots coarse, elongated, fleshy fibrous.

*C. Bolanderi, C. occidentalis, C. purpurata, C. frondosa, C. arguta, C. Sonnei.*

+++ Main roots oval or oblong, fleshy tuberiform.

*C. maculata, C. bulbifera, C. subfalcata.*

\*\* Rhizomatous species; the root axis greatly enlarged, horizontal, only partly or not at all subterranean, emitting fibrous roots from beneath.

*C. vagans, C. californica, C. grandifolia, C. dakotica.*

Incapable of placement in this scheme are the three following species, also described by Greene: *C. valida*, "stature of the plant and its underground parts not known"; *C. fimbriata*, described only from the foliage; *C. ampla*, "known to me only in the fruiting summit of a single plant."

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EXPLANATION OF THE FIGURES. PLATE 14. •

PLATE 14. FRUITS OF CICUTA. Longitudinal view (×6.5) and cross section (×9.5). FIGS. 1, 2, *C. Bolanderi*; 3, 4, *C. virosa*; 5, 6, *C. mexicana*; 7, 8, *C. Douglasii*; 9, 10, *C. Victorinii*; 11, 12, *C. mackenzieana*; 13, 14, *C. maculata*.

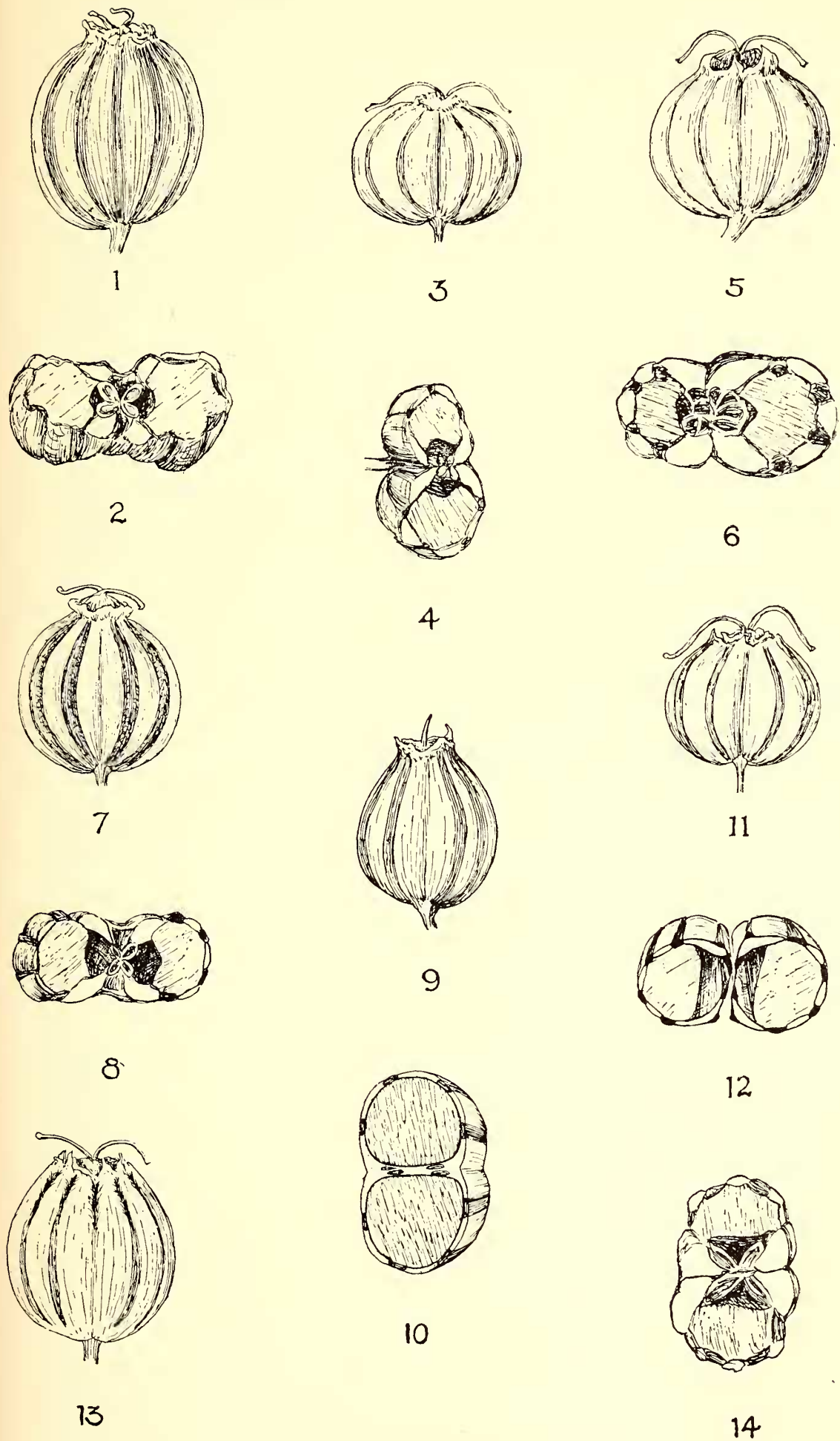


PLATE 14. FRUITS OF CICUTA.



Illustrating their scepticism of the very foundation of Greene's classification, Coulter and Rose proceeded to base their own key on their observation that the "species seem to be best grouped primarily by their oblong or orbicular fruits, further separation being made upon differences in the fruit ribs and in the foliage." Greene, however, seems not to have been at all discouraged and described *C. grandifolia* in 1907, and *C. frondosa*, *C. subfalcata*, *C. dakotica*, *C. arguta*, *C. valida*, *C. Sonnei*, *C. fimbriata* and *C. ampla* in 1912. *Cicuta cinicola* A. Nels. was added from Idaho, also in 1912, and recently *C. mackenzieana* Raup has been described from northern Canada and *C. Victorinii* Fernald from the mouth of the St. Lawrence River. Authors of manuals and floras have not been prone to accept Greene's second deluge of segregates, but have admitted *C. occidentalis* or *C. vagans* or both to their treatments of the appropriate areas.

In preparing a revision of this genus for our account of the Umbelliferae in the "North American Flora," we have had occasion to re-examine the material on which Greene based his conclusions. We are in agreement with him that *Cicuta virosa* is to be excluded from North America, although its relationship to *C. mackenzieana* appears to be rather close. We question the whole thesis that the underground parts of the water hemlocks afford specific characters, at least of the nature noted by Greene, and believe that they are so susceptible of modification in relation to soil composition and fertility, and especially to soil aëration, as to be essentially useless in this connection. Furthermore, we are unable to attach sufficient importance to the degree of leaf-division to warrant the retention of *C. californica* as distinct from *C. Douglasii*, and find that Coulter and Rose's distinction between "oblong" and "orbicular" fruits sometimes breaks down on the same plant. The diagnostic value of leaf-venation as a means of distinguishing *Cicuta* from other umbelliferous genera, and also for separating individual species in the former genus, has been stressed recently by Bomhard (1). She distinguishes *C. californica* from the other species by the fact that the secondary veins of the leaflets are directed at the marginal teeth, rather than at the sinuses between them. Our studies, however, have not enabled us to find any marked difference in this entity, which would warrant its continued retention as a species.

On the other hand, characters of the fruit, especially its compression, the proportion between the dorsal and lateral ribs, their relation to the intervals, and the nature of the oil tubes and the seed do seem to enable us to distinguish natural species in the genus. Our treatment, admits the following species for North America: *C. Bolanderi*, *C. mexicana*, *C. Douglasii*, *C. mackenzieana*, *C. maculata*, *C. Victorinii* and *C. bulbifera*. All of the species proposed by Greene will thus be relegated to the synonymy which they appear richly to deserve.

## TAXONOMIC TREATMENT

CICUTA L. Sp. Pl. 1: 255. 1753. *Cicutaria* Lam. Fl. France 3: 445. 1778. *Keraskomion* Raf. New. Fl. Amer. 4: 21. 1836.  
Type species: *Cicuta virosa* L.

Axils of the leaves not bulbiferous.

Fruit constricted at the commissure; lateral ribs about equalling the dorsals in surface display.

Oil tubes large (pl. 14, figs. 2, 6); seed oily, evidently channeled under the tubes.

Ribs narrower than the oil tubes: plants of Pacific Coast salt marshes ..... 1. *C. Bolanderi*.

Ribs broader than the oil tubes; plants of coastal eastern and southeastern United States and eastern Mexico ..... 2. *C. mexicana*.

Oil tubes small (pl. 14, figs. 8, 12); seed less oily, unchanneled or only slightly channeled under the tubes.

Fruit oval to orbicular, at least as long as broad, 2-4 mm. long, 2-3 mm. broad; rays 12-20, 2-6 cm. long; pedicels 3-8 mm. long ..... 3. *C. Douglasii*.

Fruit elliptical, conspicuously broader than long, 1.5-2.2 mm. long, 2-3 mm. broad; rays 7-14, 7-8 cm. long; pedicels 7-12 mm. long ..... 4. *C. mackenzieana*.

Fruit not constricted at the commissure; lateral ribs much broader than the dorsal in surface display.

Leaflets coarsely serrate to incised; fruit oval to orbicular, rounded at apex and base; lateral ribs prominent, about equalling the intervals ..... 5. *C. maculata*.

Leaflets finely serrate; fruit ovate, narrowed toward apex, cordate at base; lateral ribs obscure, much narrower than the intervals ..... 6. *C. Victorinii*.

Axils of the leaves bulbiferous ..... 7. *C. bulbifera*.

1. CICUTA BOLANDERI Wats. Proc. Amer. Acad. 11: 139. 1876.

Type locality. Suisun, Solano County, California, in salt marshes, *Bolander*.

Distribution. Salt marshes of central and southern California.

Representatives. *Davy 4106, 6668, 6789, 6877; Heller 7541.*

2. CICUTA MEXICANA Coult. & Rose, Proc. Wash. Acad. 1: 145. (January) 1900. *C. maculata* L. *sensu* Hemsl. Biol. Centr.-Amer. Bot. 1: 566. 1879-81, not *C. maculata* L. 1753. *C. Curtissii* Coult. & Rose, Contr. U. S. Nat. Herb. 7: 97. (December) 1900. *C. maculata* var. *Curtissii* Fern. Rhodora 41: 439. 1939.

Type locality. Coatzacoalcos, Isthmus of Tehuantepec, Vera Cruz, *Chas. L. Smith 1161*.

Distribution. New Jersey to Florida, south and west to Tamaulipas, Nuevo Leon and Vera Cruz.

Representatives. *Curtiss 6845; Heller 1165; Palmer 445; Pringle 10,804.*

3. CICUTA DOUGLASHII (DC.) Coult. & Rose, Contr. U. S. Nat. Herb. 7: 95. 1900. *Sium Douglasii* DC. Prodr. 4: 125. 1830. *Cicuta maculata* L. *sensu* Hook. & Arn. Bot. Beechey Voy. 142. 1841, not L. 1753. *C. californica* Gray, Proc. Amer. Acad. 7:

344. 1867. *C. crassifolia* Nutt. Rept. Wilkes Exped. 17: 316. 1874. *C. virosa* var. *californica* Coult. & Rose, Rev. N. Amer. Umbel. 130. 1888. *C. occidentalis* Greene, Pittonia 2: 7. 1889. *C. occidentalis* f. *frondosa* Greene, *op. cit.* p. 7. *C. purpurata* Greene, *op. cit.* p. 8. *C. vagans* Greene, *op. cit.* p. 9. *C. grandifolia* Greene, Leaf. Bot. Obs. 2: 124. 1909. *C. Douglasii* var. *occidentalis* Jones, Bull. Univ. Mont. Biol. ser. 15, 42. 1910. *C. Sonnei* Greene, Leaf. Bot. Obs. 2: 239. 1912. *C. subfalcata* Greene, *op. cit.* p. 237. *C. frondosa* Greene, *op. cit.* p. 236. *C. valida* Greene, *op. cit.* p. 238. *C. fimbriata* Greene, *op. cit.* p. 240. *C. cinicola* A. Nels. Bot. Gaz. 54: 141, fig. 1. 1912. *C. occidentalis* f. *californica* Wolff ex Engl. Pflanzenr. 4<sup>228</sup>: 90: 82. 1927. *C. occidentalis* f. *oregonensi-idahoensis* Wolff, *op. cit.* p. 82. *C. occidentalis* f. *arizonensis* Wolff, *op. cit.* p. 82. *C. occidentalis* f. *wyomingensis* Wolff, *op. cit.* p. 82.

Type locality. "In America boreali-occid.," Douglas.

Distribution. Alberta and Montana to western Alaska, south to California, New Mexico, Arizona and Chihuahua.

Representatives. Baker 655; Brown 501; Cusick 2556, 2779; Heller 7174; Nelson & Macbride 1315; Townsend & Barber 57.

4. *CICUTA MACKENZIEANA* Raup, Journ. Arn. Arb. 17: 279, pl. 197. 1936.

Type locality. Sandy margin of a lagoon near the south shore of Lake Athabaska about 1.5 miles west of Ennuyeuse Creek, Canada, August 25, 1935, Raup 6976.

Distribution. Hudson Bay to the Mackenzie Basin.

Representatives. Macoun 79,261; Raup 6764, 6964.

5. *CICUTA MACULATA* L. Sp. Pl. 1: 256. 1753. *C. maculata* Lam. Encycl. 2: 2. 1786. *C. virosa* var. *maculata* Coult. & Rose, Rev. N. Amer. Umbel. 130. 1888. *C. dakotica* Greene, Leaf. Bot. Obs. 2: 237. 1912. *C. arguta* Greene, *op. cit.* p. 238. *C. ampla* Greene, *op. cit.* p. 241. *C. dakotica* var. *pseudovirosa* Lunell, Amer. Midl. Nat. 4: 486. 1916. *C. dakotica* var. *pseudomaculata* Lunell, *op. cit.* p. 486.

Type locality. Virginia, Kalm.

Distribution. Prince Edward Island and Quebec to North Carolina and Tennessee, west to North Dakota and Texas.

Representatives. Fernald & St. John 1141; M. L. Grant 3238; Heller 1002; Lindheimer 615.

6. *CICUTA VICTORINII* Fern. Rhodora 41: 441, pl. 561, figs. 1-2. 1939.

Type locality. Tidal flats of the St. Lawrence River, Quebec: "greves intercotidales, Cap Rouge pres du Pont de Quebec, 9 aout 1922," Victorin 15,479.

Distribution. Known only from the estuary of the St. Lawrence River, Quebec.

Representatives. Fernald & Long 24,249; Victorin 15,480.



7. *CICUTA BULBIFERA* L. Sp. Pl. 1: 255. 1753. *Cicutaria bulbifera* Lam. Encycl. 2: 3. 1786. *Keraskomion bulbiferum* Raf. New. Fl. 4: 21. 1836.

Type locality. Virginia, Canada, *Clayton*.

Distribution. Newfoundland and Quebec to Delaware and Pennsylvania, west to British Columbia and Oregon.

Representatives. *Cusick 2966; Heller & Heller 551; Sandberg, MacDougal & Heller 789*.

Department of Botany,  
University of California, Berkeley,  
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3. ————. Contr. U. S. Nat. Herb. 7: 93-100. 1900.
4. GREENE, E. L. Pittonia 1: 271-272. 1889.
5. ————. Pittonia 2: 1-11. 1889.

## GREAT BASIN PLANTS—VI. NOTES ON GENTIANA

BASSETT MAGUIRE

Continuing the series of minor papers discussing plants of the Great Basin, these notes are concerned with the delineation of a newly recognized geographical population of *Gentiana calycosa*, and the confirmation of a range extension of *G. barbellata*. All specimens herein cited are on deposit at the Intermountain Herbarium. The United States Forest Herbarium, Washington, D. C., is designated by the symbol USFH.

*GENTIANA BARBELLATA* Engelm. The following collection confirms the queried inclusion of the species within the Utah range by Tidestrom. UTAH. Sanpete County: frequent, stony, steep, west-facing slopes, summit of Horse Shoe Mountain, South Peak, 12,000 feet, Manti National Forest, August 11, 1940, *Maguire 20059*.

*GENTIANA CALYCOSA* Griseb. subsp. *typica* nom. nov., *G. calycosa* Griseb. in Hook. Fl. Bor. Amer. 2: 58. 1838. *Dasystephana obtusiloba* Rydb., Bull. Torr. Bot. Club 40: 464. 1913. *D. monticola* Rydb. *l.c.*

*GENTIANA CALYCOSA* Griseb. subsp. *asepala* subsp. nov. Herbae perennes parvulae; caulibus decumbentibus, 5-10(12) cm. longis; foliis ovatis vel ovato-ellipticalibus 1.0-1.5(1.7) cm. longis; floribus solitariis; corollis 3-4 cm. longis; calicibus membranaceis, graviter incisus, lobis obsoletis vel inconspicuis subulatisque, rare excedentibus 1-1.5 mm.

Low perennial herbs; stems decumbent, 5-10(12) cm. long; leaves ovate to ovate elliptical 1.0-1.5(1.7) cm. long; flowers solitary, corolla 3-4 cm. long; calyx membranaceous, character-